

ENERGY EFFICIENCY SECTOR: LED TRAFFIC SIGNALS

◆ COLORADO

LED Traffic Signals

In 1996, the City and County of Denver began replacing traditional incandescent bulb traffic and pedestrian signals with LED (Light-Emitting Diode) signals. LED signals use less electricity to produce the same amount of light output as traditional traffic signals. Furthermore, the lifetime of an LED signal is more than ten times that of an incandescent bulb signal, reducing maintenance and replacement costs drastically. A third advantage is that LED signals are made up of hundreds of small diodes rather than a single light source, so the signal is less likely to burn out and cause traffic delays or accidents. These factors, combined with technological advances that have driven the cost of LED signals down by 50% in the last few years, made LEDs a logical and cost effective choice for Denver. So far, only the red traffic lights and orange pedestrian signals have been replaced, but replacement of the green traffic lights is underway. This project was the recipient of the 1997 Outstanding Project of the Year award and helped Denver to win the 1997 Government Partner of the Year award from EPA's Green Lights Program.



Results:

Approximately 20,500 traffic signals in the Denver area have been replaced with LEDs. Each installation replaces a 150 watt or 69 watt incandescent bulb with LEDs requiring only 14 watts or 8 watts of electricity respectively. The annual energy savings associated with this reduction are 9.4 million kWh.

These savings reduce emissions of 5,300 metric tons of CO₂ (1,440 MTCE*) each year. In addition, switching to LED signals avoids 23.3 metric tons** of SO₂ and 20.8 metric tons** of NO_x emissions each year. Although the initial cost of the LEDs is higher than the cost of conventional bulbs, the lower energy requirements of the new LED signals saves over \$276,000 each year and the savings on materials and labor are more than \$154,000 each year, for total annual savings of over \$430,000. The LED signals have a payback period of less than four years and the total cost savings over the lifetime of the fixtures is estimated to be over \$6.1 million.

Annual Cost Savings	Criteria Pollutant Emission Reductions	Annual Emissions Savings
\$430,000	23.3 MT** SO ₂ 20.8 MT** NO _x	1,440 MTCE*

Principal Actors:

The traffic light retrofit described in this case study is part of Denver's participation in Cities for Climate Protection-US, a program of the International Council for Local Environmental Initiatives (ICLEI). Denver's Utility Agency worked with and provided funding for the Public Works Department, Traffic Operations Division to install the new signals.

Additional Information:

Dr. Darryl Winer, Director of Utilities, Denver Utilities Agency, 720-913-4851; Traffic Operations Division website: <http://www.denvergov.org/dephome.asp?depid=375>.

This case study is based on information provided by Dr. Darryl Winer and contained in the 1998 report *U.S. Communities Acting to Protect the Climate* prepared by the International Council for Local Environmental Initiatives (ICLEI). Financial and energy savings from the ICLEI report were calculated based on new signal replacement numbers provided by Dr. Winer.

*Original data have been converted from kWh to Metric Tons of Carbon Equivalent (MTCE) using the following emission factors: 1.244 lbs CO₂ / kWh (The Cadmus Group, Inc. *Regional Electricity Emissions Factors Final Report*, The Cadmus Group, Inc., 1998, Exhibit 6), One metric ton=2205 lbs.

**SO₂ and NO_x savings were calculated using emission factors of 5.46 lbs SO₂/MWh and 4.89 lbs NO_x/MWh (*The Emissions & Generation Integrated Database(E-GRID)*, EPA/Acid Rain Program).